The Natural History of Nosocomial Colonization and Contamination with Multidrug Resistant Organisms in a Military Treatment Facility in Iraq

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Background

The clinical and public health dilemma of multidrug resistant (MDR) gram negative infections in war trauma patients and the Military Health System (MHS) raises several questions:

- What are the sources?
- Do MDR organisms (MDRO) pre-exist in the environment?
- Do they pre-exist in patient/staff colonization?
- Are they directly inoculated at time of trauma?
- Are they nosocomially spread?
- What are the dynamics of this outbreak?

Objectives

1. Performance improvement and infection control initiative
2. Describe state of the environment prior to patient care
3. Describe evolution of MDRO contamination:
   - Environment
   - Patients
   - Staff

Methods

Routine serial sampling with culturette swab transport systems of environmental surfaces, personnel, and patients

Transported via US Postal Service to WRAMC microbiology lab

Samples inoculated to blood and MacConkey agar plates

Gram negative identification and antimicrobial susceptibility testing performed on Phoenix 100 microbial analyzing system (Becton-Dickinson)

MDRO: resistant to three or more classes of antibiotics and/or ESBL+

High risk organism (HRO): sensitive isolates of *Acinetobacter sp., Enterobacter sp., Klebsiella sp., E. coli, P. aeruginosa*

Clonal relationships determined by pulse field gel electrophoresis (PFGE)

Data collection via Excel and Filemaker Pro, analysis via SPSS

Feedback to command regarding contaminated surfaces

Results

1348 total swabs yielding 654 isolates
- 308 swabs of 157 patients……29 MDRO
- 246 swabs of 126 personnel……3 MDRO
- 794 environmental swabs of 22 patient care areas……10 MDRO

42 total MDRO
- 2 *Acinetobacter* – each unique on PFGE
- 38 Enterobacteriaceae
- 1 MDR *P. aeruginosa*
- 1 MDR *Achromobacter*

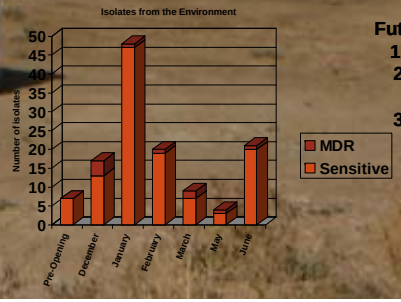
157 patients
- Average age 28.8 years; 88.4% male
- Multinational representation:
  - US Military 27.7%
  - US Civilian 4.5%
  - Iraqi national 42.6%
  - Georgian 22.6%
  - Other 3.2%

18 patients with 29 MDROs isolated on 23 swabs
All 18 MDRO present from first day of presentation for care

16/18 of those patients were Iraqi nationals
(multivariate logistic regression analysis odds ratio = 19.5, P=0.005)

126 personnel
Medical Company (n=86) + Forward Surgical Team (n=40)
- *E. coli* from non-scrub nurse in theater for 2 days
- *E. coli* from medic in theater for 200 days
- *Achromobacter* from anesthetist in theater for 272 days

22 patient care areas yielded 10 MDRO
Number of MDRO isolated in new areas before patient care: 0

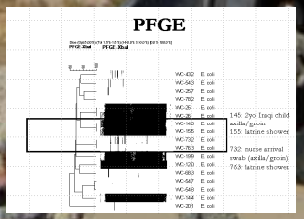


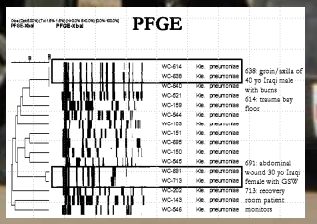
Discussion

New health care facility became rapidly contaminated after patient care initiated

Colonization of U.S. health care workers is minimal and limited

Most MDRO isolated from Iraqi patients; suspect this represents colonization in the community because this facility was the first point of care for Iraqi patients (not transferred)





Iraqi patients might be an attributable source of MDRO in the MHS

MDROs primarily isolated from Iraqi national patients proven to then contaminate the environment (PFGEs above)

Advantages of this initiative:
1. Sampling occurred prior to patient use and upon immediate arrival in theater
2. Serial prospective sampling continued as long as possible
3. Large sample sizes
4. Multinational cohort
5. Sampling occurred at beginning of evacuation chain

Implications for policy:
- Patient cohorting
- Targeted decolonization

Future directions:
1. PFGE linkage of HRO and clinical isolates
2. Evaluations of infection control interventions (e.g., decolonization efficacy)
3. Environmental sampling in context of cohorting

Disclaimer

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